

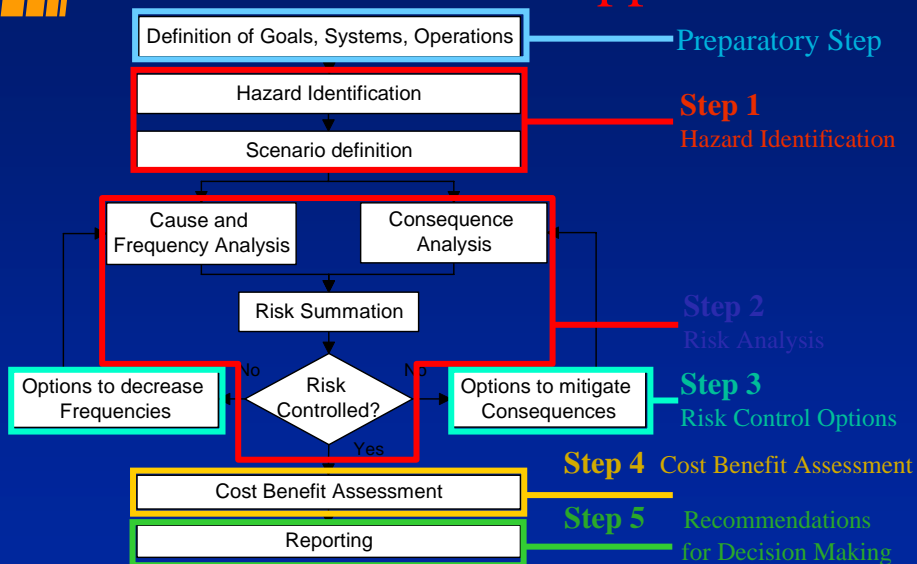
Open Workshop on Risk-Based Approaches  
in the Maritime Industry, May 2007, NMRI

## Cost Benefit Assessment

Toshiro Arima,  
Nippon Kaiji Kyokai

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## FSA - a risk based approach

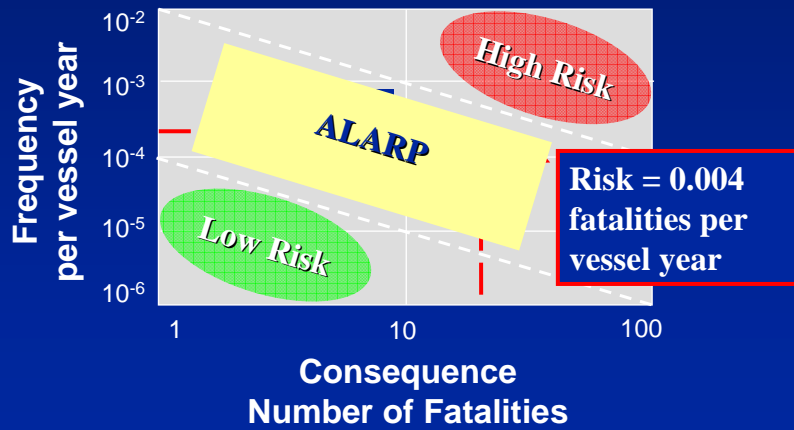


Reference: IACS FSA Training Modules

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## Risk Acceptance and RCOs

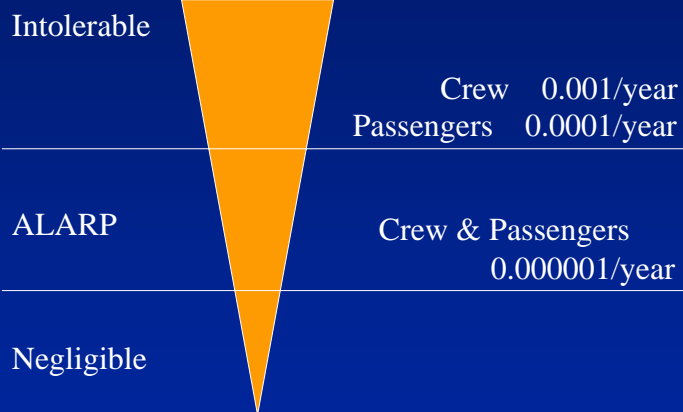
In As Low As Reasonably Practicable (**ALARP**) Region, **Cost Effective RCO** should be sought.



Reference: IACS Presentation at IMO

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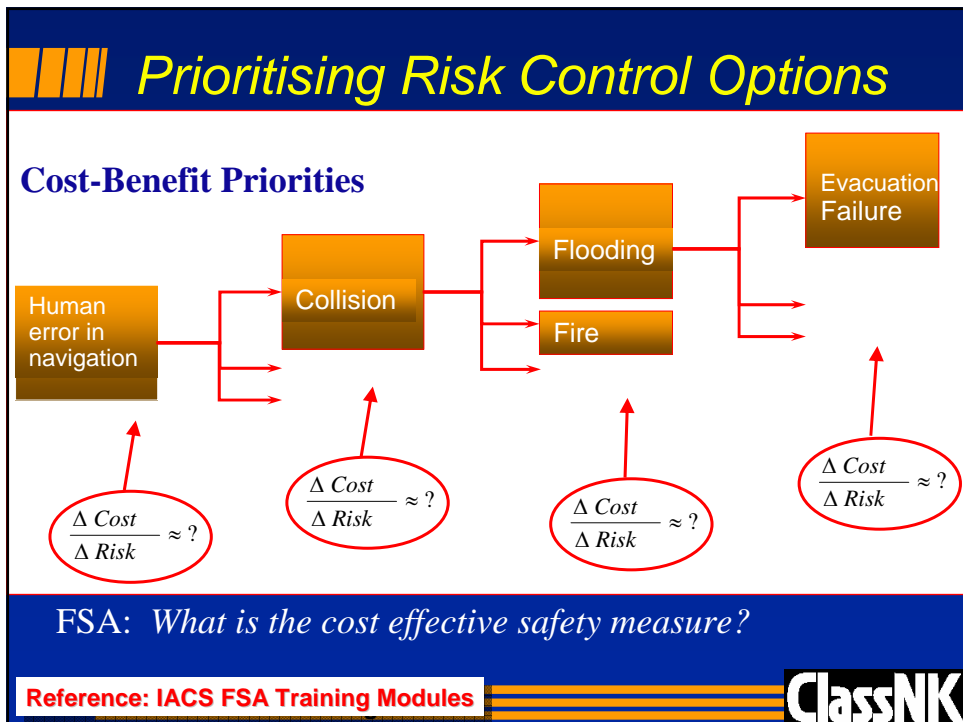
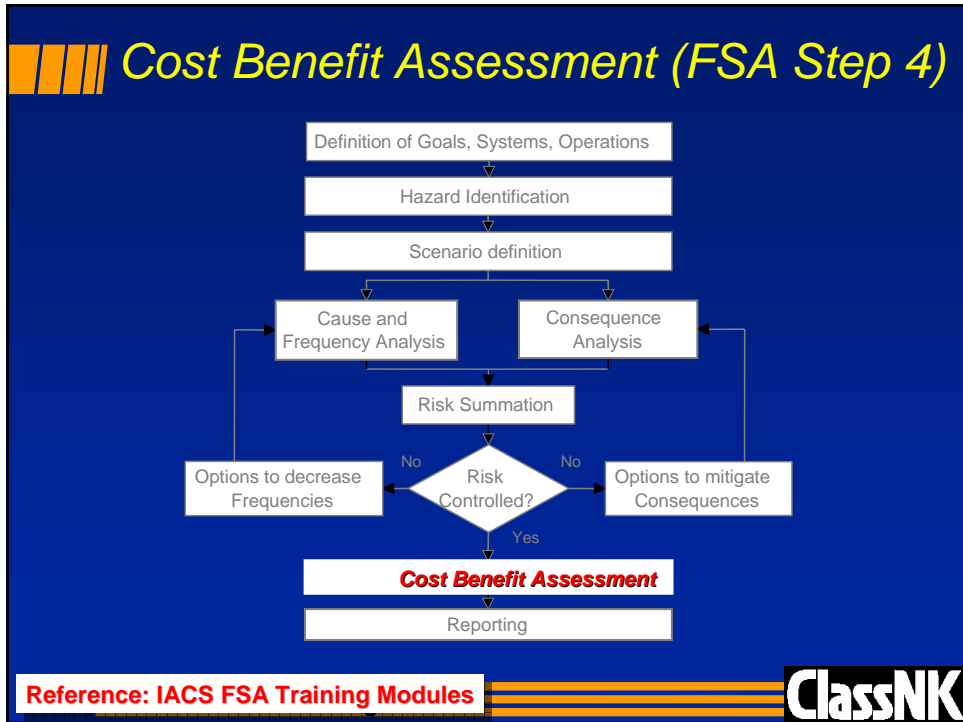
## Risk Acceptability – Individual Fatality Risk



*Interpretation of HSE,  
and other standards adopted for ships*

Reference: IACS FSA Training Modules

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## Cost Benefit Assessment

- Types of costs, which may be considered, e.g.:
  - investment costs
  - costs related to operation, training
  - costs related to inspection, maintenance
- Types of benefits, e.g.:
  - reduced fatalities/injuries
  - reduced loss of properties (vessel, payload, etc.)
  - reduced damage to the environment
- Risk control options will be ranked according to their **cost effectiveness**

Reference: IACS FSA Training Modules

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## Cost Benefit Assessment

Simple & Economical Acceptance criteria:

$$\text{Costs}(\pounds) < \text{Benefits}(\pounds)$$

- **Losses** (life, environmental resources etc.) are converted to **monetary units** i.e. a resource in an economic activity-conflicting to ethical traditions/values.
- **Not suitable** for acceptance criteria w.r.t. **Safety**, i.e. loss of life consequences etc.

Reference: IACS FSA Training Modules

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## Cost Benefit Assessment

Two measure to assess Cost Effectiveness of a risk control option (RCO) are available:

- GCAF (Gross Cost of Averting a Fatality)**  
 Costs are put into relation to the reduction in risk to persons (i.e. fatalities averted):

$$GCAF_{RCO} = \frac{\Delta Costs_{RCO}}{\Delta Risk_{RCO}}$$

- NCAF (Net Cost of Averting a Fatality)**  
 Costs and economic benefits from RCO, are put into relation to risk reduction to persons:

$$NCAF = \frac{\Delta Costs_{RCO} - \Delta Economic\ Benefits_{RCO}}{\Delta Risk_{RCO}}$$

Reference: IACS FSA Training Modules

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## Risk Tolerability and Acceptability GCAF - Shipping

Decision for:	Decision Maker / Year of decision	GCAF [million US \$]
Strengthening bulkheads on existing bulk carriers	IACS /1997	0.4 - 1.5
Installing water ingress detection, level alarms and level monitoring systems on all bulk carriers	IMO / 2002	0.1 - 9.5
Fitting of a forecastle for new bulk, ore and combination carriers (UR S28)	IACS / 2004	0.2 - 4.8
Free-fall lifeboats for new bulk carriers	IMO / 2002	-0.5 - 0.8
Double side skin construction for all new bulk carriers > 150m. Note: decision later withdrawn.	IMO / 2002	0.8 - 15.9
<b>Decision against</b>		
Free fall life boat for existing bulk carriers	IMO 2002	2.7 - 9
Helicopter landing areas on non RoRo / passenger ships	IMO / 1997	> 70
Secure status indication (open/closed) for cargo hatchway covers on bulk carriers	IMO 2002	0.5 - 2.5

Reference: IACS FSA Training Modules

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## Risk Tolerability and Acceptability GCAF - Shipping

Decision for:	Decision Maker / Year of decision	GCAF [million US \$]
<p><b>Suggestions in MSC 72/16 and <u>Experiences at IMO</u> used for both <u>GCAF</u> and <u>NCAF</u>;</b></p> <p><b>US\$ <u>3</u> million per fatality averted</b></p>		
passenger ships		
Secure status indication (open/closed) for cargo hatchway covers on bulk carriers	IMO 2002	0.5 - 2.5

Reference: IACS FSA Training Modules

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## Cost Benefit Assessment

- Cost Benefit Assessment related Marine Environmental Issues is under discussion.

e.g. **GCATS**, a proposal by **SAFEDOR**  
(Gross Cost of Averting a Tonne of oil Spill)

$$GCATS < F \times \text{US\$ } 30,000$$

Reference: IACS FSA Training Modules

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